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the earth's rotation; (3) the height of the atmosphere; (4) the size and progression of low pressure areas; (5) cloud heights; (6) high balloon and kite ascents; (7) the altitudes of observatories; (8) the deepest boring for earth temperatures; and (9) the area embraced in the regular weather maps of the Deutsche Seewarte. This summary is not only useful in itself, but it adds greatly to the value of the globes for purposes of instruction. At the end several diagrams are given, which, in order to bring out the relative dimensions and areas with reference to the globes, are intended to be pasted onto papers of the proper thicknesses, and then to be applied to the globes. These diagrams represent (1) the height of cirrus clouds; (2) the average area covered by a typhoon; (3) the average area covered by an ordinary cyclone; (4) the area covered by the German weather maps; (5) the height of the atmosphere, and (6) the circle of visibility of luminous clouds.

It is to be hoped that Professor Kassner's excellent work on these globes will receive proper recognition in the United States, and that the globes will find a place in the equipment of many geographical and meteorological laboratories.

NIUE: A RECONNAISSANCE.

BY

WILLIAM CHURCHILL.

NIUE-FEKAI, traditional names Nuku-tu-taha, Motu-te-fua, Fakahoa-motu, Nuku-tuluea. Latitude (south point, Halafualagi), $19^{\circ} 10'$ S, longitude, $169^{\circ} 17'$ W; length (N-S), ca. 17 miles; width (E-W), ca. 11 miles; perimeter, ca. 40 miles; average elevation, 220 feet. Population: Polynesian; mission census 1899, 4,576, distributed as follows in village communities—Alofi, 719 and 49 students at the mission school; Tamakautoga, 275; Avatele, 401; Fatiau, 104; Hakupu, 456; Liku, 383; Lakepa (or Tamalagau), 234; Mutalau, 524; Hikutavake and Tamahatokula, 248; Tuapa (or Uhomotu), 426; Makefu, 196; absent on foreign islands, 561. British Residency, Alofi; head station of the London Missionary Society, Alofi; residence of the Patu-iki (king) Togia-Pulu-toaki (anointed June 30, 1898), Tuapa. First set upon the charts by Captain Cook in his second voyage, sighted June 20, 1774, landed June 21 at Opahi, named Savage Island. First mission visit, John Williams in the *Messenger of Peace*, July, 1830, at Falekula; first resident European missionary, Rev. W. G. Lawes, 1861, at which time the whole island, save 8 persisting heathen, had been converted by Samoan teachers. Annexed to Great Britain, April 20 and October 19, 1900; annexation transferred to New Zealand, June 11, 1901.

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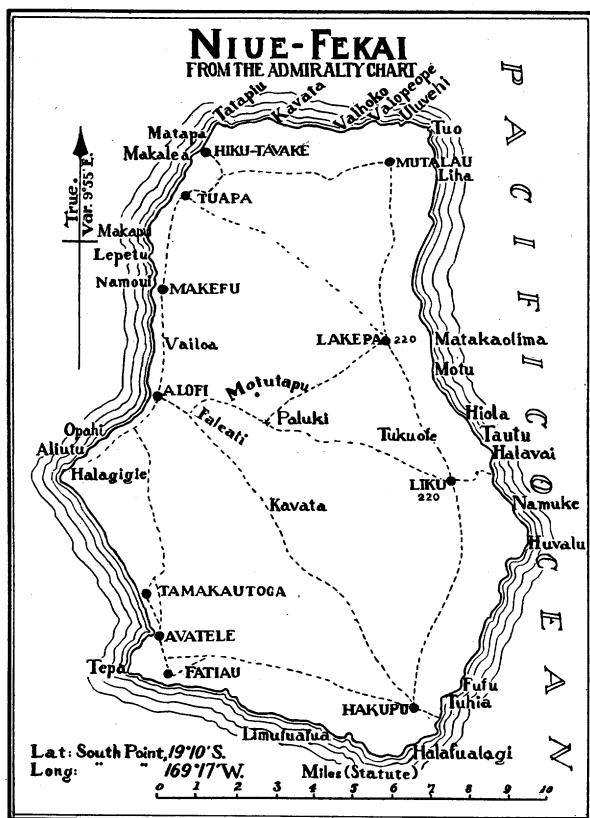
(From the *Fale'ula Bibliography*.)

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Overlaid by the impertinences of names given by discoverers in honor of themselves or of their patrons, the charts of the Pacific yet disclose in abundant measure the working of the lust of the eyes and the pride of life, that great charm with which the South Seas have ever drawn wandering men, the best no less strongly than the worst. In the former category it has been sought to commemorate Anna Maria and Rimsky Korsakoff and Sarah Scott and that noble lord whose sufficient fame may properly rest upon his invention of the sandwich. On the other hand, see how the joy of the South Seas smiles out from such names as Anse des Amis, Bay of Bon Accord, Buenos Jardines Island matched by Paradise Island, Pleasant Island, the Friendly Islands, Gente Hermosa. It is a strange contrast, well nigh unique in the Pacific tract, to meet with the stern name Savage Island which Cook bestowed upon Niuē-fekai, or Niuē as it is more commonly denominated.

Cook had reason. He made a landing at two places on the west coast of the island and at each he was fiercely attacked by the islanders. His experience was not singular. Since his time and until the conversion of the inhabitants most landing parties, whether from armed vessels, from whalers and traders, or even the mission ships, have been attacked and beaten off. So far as Niuē retains traditions of its past (and it is in singular contrast with the other Polynesian lands where the past forever lives on the tongues of present men) there is the same story of resistance to the landing of the hardy wanderers of the Pacific of their own stock. Niuē has reason for this repelling front set toward visitors. They know that their small, waterless and infertile island is none too large for their own

natural increase and that little space can be spared for colonists. Further than this Niuē had learned to dread contact with the world outside whence came at intervals epidemics of influenza quite beyond the resources of their home medication, for their most ancient history had taught them that outer visitors meant stricken homes and dear ones gone. Small wonder, then, that when a sail was spied in the offing the Niuēan, not from innate ferocity but from prudence,



grasped his *katoua* or wooden sword, stuffed his war girdle with *maka-pou-ana* or throwing stones, crammed his bushy beard into his mouth to make his visage more terrifying and took his stand upon the beach to defend his home.

Niuē is of a type seldom found among the myriad islands of the South Seas, the raised coral land. Such as are known occur uniformly at the border of one of the great masses of vulcanic extrusion. Niuē is an offshore outlier of the great Tongafiti Y which

may easily be traced on the bathygraphic charts of the South Pacific. Its lower stem rises high above the level of the sea in the two great islands of New Zealand. Its continental unity is continued north-erly at no great depth to a little beyond the Kermadecs and there forks in the direction of the two archipelagoes which make its name appropriate in the best Polynesian usage, Tonga and Fiji. It is off the eastern or Tonga arm that Niuē has undergone the mighty travail of a world in the making.

My own notes of the physiography not only give me no warrant to alter the record of Percy Smith's observations, but they rather qualify me to express a cordial appreciation of their accuracy. He is a geographer of such secure attainments as might be expected of one who served as Surveyor General of New Zealand until the march of years permitted him to retire to the uninterrupted study of Polynesia, which had been the pursuit of a lifetime and which qualified him as the first British Resident on this island to formulate the simple system of law through which its order is preserved. In these words he presents the structural picture of Niuē:

"The island has been raised by several efforts of the subterranean forces, as is plainly visible in the terraces which surround its shores. These elevations have been unequal in character and extent, and practically may be reduced to two. The earliest caused the central part of the island to rise about 130 feet, and thus it remained for ages, the wide terrace on which most of the villages now stand being at that time the encircling or fringing reef."*

The other great elevation raised the island a further height of about 80 to 90 feet, since which time little change appears to have taken place beyond the eating of the surf into the cliffs of coral. There are indications here and there that the island was once an atoll, with probably a very shallow lagoon now shown by the brown reddish earth of the centre of the island, which is formed of very much decomposed coral rock. This reddish earth is a feature of other raised coral islands as noticed by both Darwin and Dana. Where not occupied by this reddish earth the surface of the island is extremely rocky, the gray weathered surface of the coral showing in fantastic rugged masses that make travelling off the paths very difficult indeed. The island may be likened to an inverted soup plate, in which the rounded edge represents the lower terrace, the rim the old margin of the lagoon, and the bottom the level or undulating surface of the old lagoon. Coral (*feo*) is the only rock to be found on the island—there is no sign of any volcanic rock whatever. It decomposes into a fertile soil in the hollows of the rocks, more so than the reddish earth, which is not so rich but yet often

* A close examination of the terrain at frequent intervals at the foot of the older terrace leads me to the conclusion that this old reef was wholly a fringing one.

supports a dense vegetation. The second elevation of the island appears to have been of a more sudden character than the first, for it was probably during that period that the series of longitudinal chasms were formed that so frequently are found at the foot of the higher terrace—the old shore line, in fact, before the second elevation. Some of these chasms are very picturesque, overhung as they are by the rich vegetation of the tropics and frequently containing in the bottoms pools of water which serve as the water supply of the people. It is along this lower terrace—which may average about one-third of a mile in width—that six out of the eleven villages are situated.

The present reef of the island is a fringing one about 60 to 80 yards in width, with numerous passes through which, at least on the western side (for that lies to leeward during the eight months of the southeast trades), landing may be made. The subterranean conditions of the Niuē foundation may be elucidated by a study of the borings made at Funafuti.

Economic vegetation is naturally conditioned by terrain. The soil is thin and either has not formed a stratum of proper humus or has not been able to retain such against the torrential rains. Arable patches, therefore, must be sought in chasms and depressions and when found are of restricted area. The island has no streams, its water supply consisting wholly of catchment pools and wells of infiltration water which has lost its saline constituent in passing from the sea through the porous coral rock. Largely covered with timber the island shows primeval forest, second growth groves on spots of abandoned cultivation and newly opened gardens. In the latter are raised the great Polynesian food staples, the yam, the taro, the plantain, the coconut and the arrowroot. But the difficulties of nature have advanced the Niuēan further toward the agronomic arts than others of his race, who live under a more bountiful nature which invites simply to reach out and pluck of her abundance; here man must labor for his sustenance, a condition of life not without its moral effect upon the people.

The only mammals are the rat and the bat, the former being deliciously edible, the latter susceptible of being made palatable. Birds abound, among them being that Pacific *Carpophaga* pigeon which is a worthy addition to any bill of fare. Fish are numerous and contribute largely to stock the larder.

The domestic arts of the kitchen have developed along the same lines as with other members of the race. Viands are cooked in pit ovens in leaf packets. There are many varieties of the so-called

puddings, made dishes of the several vegetables mixed with salt water or the water of the coconut, many of which are far from unpalatable. That their pleasures of the table might assume Gargantuan proportions is shown in this fact, one which rests on no hearsay evidence. At the feast over the opening of the new church at Liku one of the viands was a taro pudding of 220 yards length. The stones of the oven in which it was baked are there yet in situ and have been measured with Gunter's chain.

The arts and customs of Niuē are those of Polynesia at large, yet a few exceptions are noted which challenge the attention because of their singularity. The most noteworthy of these exceptions are the absence of tattooing and the neglect to drink the kava which grows spontaneously on their island. The great importance of these omissions lies in the fact that it serves to point out the time when Niuēan settlement parted from the general family of advancing Polynesians. The inference is beyond doubt a just one that it was before these two customs had become engrafted upon Polynesian life. I shall not venture as yet to assign a date to the arrival of these two great features of the life of the Polynesians, for my studies in the coordination of the legends have not progressed to the stage of anything like positive date determination, but I have abundant myth-history showing that there was a time when the Samoans came into possession of both these arts by acquisition from westward neighbours of the Melanesian stock.

Comment has already been made in passing upon the scanty possession of historical traditions by the Niuē folk. It was a fortunate thing that Percy Smith has given particular attention to the study of Polynesian origins, for when he assumed his official station at Alofi he lost no time in securing from the wisest men of Niuē the fullest account of the story of the settlement of the island and of the succession of their Patu-iki. This record he has published with translation and comment and for that alone his narrative would be commendable even if it did not contain, as it indeed does, all those other elements of the record of intelligent research which make it truly a monograph of the most satisfactory type. The people of the island yet retain the distinction into Motu, the primitive settlers, and Tafti, newcomers of a later migration. They preserve the knowledge that they came from Tonga, from Fonua-galo, from Tulia. The two latter prove nothing, and Tonga is everywhere along the track of Polynesian swarming, it is a directive rather than a place name, for the present Tonga is distinctly contra-indicated. We must omit the ingenious and forceful argument by which our author makes out

an excellent case for Samoa as the swarming point of the Niuē peoples. The results which he reaches are to be found in the two following extracts:

"Now I take it to be somewhere in the above period, *i. e.*, from the eighth to the thirteenth century, that Niuē received its first inhabitants. It was probably after the commencement of the great voyages which led to a knowledge of most of the islands in Central and Eastern Polynesia—and this was approximately that year A. D. 650. We may say tentatively that Niuē was first occupied by the Motu people in about A. D. 700. The reason I fix on this date is that the people have many of the traditions common to the race the period of which is prior to A. D. 700, but so far as I gathered none of a later date that are not merely local. Many of the great heroes of Polynesian history are unknown to the Niuē people because they flourished after the migration to Niuē."

"As to the origin of the Tafti people it seems to me probable that they were some of the Tonga-Fiti people who occupied the coasts of Samoa and were expelled from there at the time of Matamatamē or when Savea became the first king of all Samoa and received the name for the first time of Malietoa. This occurred, according to the several Samoan genealogies, about the year 1250, or about 550 years after the arrival of the Motu people at Niuē. This period is characterized in Polynesian history by the close connection of the Polynesians with the Melanesians in the Fiji group, when intercourse was frequent and intermarriage constant. Hence the greater Melanesian strain in the Tafti people than in those of Motu. It is due also to this Melanesian intercourse that the large number of Tongan words with some of their grammatical forms was introduced into Niuē, gradually overriding and replacing much of the purer Polynesian dialect spoken by the Motu people, the traces of which are still apparent in their old songs."

Thus are we led to the final work of this Niuē series, the dictionary and grammar. In this work Percy Smith enlisted the collaboration of another past president of the Polynesian Society, Edward Tregear, an indefatigable laborer in this interesting field and the author of the dictionaries of Mangareva and the Paumotu, as well as the Maori Comparative Dictionary, a work without which study of the philology of the South Seas would be well nigh impracticable.

The vocabulary is excellent and will be found to shed a new light on the primitive signification of words in other languages of the great Polynesian family which in illiterate ages have lacked the record of their growth into widely diverse meanings. This vocabulary has its base in one compiled by Rev. F. E. Lawes, the present resident missionary at Alofi, to which the present authors have added many words derived from a collation of the material brought back by Percy Smith from Niuē and from a reading of the translation of the Bible undertaken by Mr. Tregear.

The grammar is the work of the two Messrs. Lawes who have devoted their lives to the education of Niuē. It is brief and negligible, for it is based upon an entirely impossible conception of the language. Hitherto all the attempts at grammars of Polynesian tongues have been modelled upon the grammar of English. The first attempt to develop the grammar of any Polynesian language as a speech of isolating type is the comparative grammar of the Samoan upon which I am now engaged. This will establish the principles of the language and may readily be applied to any of the tongues in the Polynesian Pacific.